

INDOOR AIR

Volume

2

Radon, Passive Smoking, Particulates and Housing Epidemiology

Editors

BIRGITTA BERGLUND

Department of Psychology, University of Stockholm

THOMAS LINDVALL

**Karolinska Institute and the
National Institute of Environmental Medicine**

JAN SUNDELL

National Board of Occupational Safety and Health

**Swedish Council for Building Research
Stockholm, Sweden 1984**

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL
INFORMATION SERVICE
SPRINGFIELD, VA. 22161

2023510197

Proceedings of the 3rd International Conference on Indoor Air Quality and Climate

**held in Stockholm
August 20-24, 1984**

***Under the High Patronage of
His Majesty King Carl XVI Gustaf***

**Organized by
The Karolinska Institute and
The National Institute of Environmental Medicine
with the cosponsorship of
The World Health Organization**

Sponsored by
Commission of the European Communities
Swedish Ministry of Health and Social Affairs
U S Environmental Protection Agency
Swedish Council for Building Research
Swedish Work Environment Fund
National Institute of Radiation Protection (Sweden)
Representatives of European Heating and Ventilating Associations
American Society of Heating, Refrigerating and Air-Conditioning Engineers
Electric Power Research Institute (USA)
Gas Research Institute (USA)
Ruhrgas AG (FRG)
Kawasaki Ltd (Japan)
Drägerwerk AG (FRG)
Fläkt AB (Sweden)
Bahco AB (Sweden)
Brüel & Kjær (Denmark)

2023510198

INDOOR AIR

Volume 2

**Radon, Passive Smoking, Particulates
and Housing Epidemiology**

2023510199

The 3rd International Conference on Indoor Air Quality and Climate

Organizing committee

Thomas Lindvall, M.D., Professor (President)
Karolinska Institute and National Institute of Environmental Medicine
Stockholm, Sweden

Birgitta Berglund, Ph.D., Professor
Department of Psychology, University of Stockholm and Swedish Council
for Research in the Humanities and Social Sciences, Stockholm, Sweden

Jan Sundell, M.Sc.
National Board of Occupational Safety and Health, Stockholm, Sweden

Overseas coordinators

Professor Kazuho Maeda
Department of Epidemiology, University of Tokyo, School of Health Sciences,
Tokyo, Japan

Dr Demetrios Moschandreas
IIT Research Institute, Chicago, Illinois, USA

Professor Bernd Seifert
Institute of Water, Soil and Air Hygiene, Berlin, Federal Republic of
Germany

Dr Peter Warren
Building Research Establishment, Watford, England

Advisory committee

Dr Ib Andersen
Danish National Institute of Occupational Health, Denmark

Dr David R Berg
U S Environmental Protection Agency, Washington DC, USA

Dr Ulf Berglund
Royal Institute of Technology and National Institute of Environmental
Medicine, Sweden

Dr Irwin Billick
Gas Research Institute, USA

Professor Trygg Engen
Department of Psychology, Brown University, USA

Professor Povl Ole Fanger
Laboratory of Heating & Air Conditioning, Technical University of
Denmark, Denmark

Professor Benjamin Ferris Jr
School of Public Health, Harvard University, USA

Professor Lars Friberg
Karolinska Institute and National Institute of Environmental Medicine,
Sweden

2023510200

Professor Gideon Gerhardsson
Swedish Employers Confederation, Sweden
Dr Anna Hambræus
Institute of Clinical Bacteriology, University of Uppsala, Sweden
Dr Helmut Knöppel
Joint Research Centre, Commission of the European Communities, Italy
Dr H W de Koning
Division of Environmental Health, World Health Organization,
Switzerland
Professor Michael D Lebowitz
Health Science Center, University of Arizona, USA
Dr Anthony Nero
Lawrence Berkeley Laboratory, University of California, USA
Professor Jan Stohr
School of Medicine, Yale University, USA
Dr Ralph M Perhac
Electric Power Research Institute, USA
Professor Eystein Rødahl
Norwegian Institute of Technology, University of Trondheim, Norway
Dr John D Spengler
School of Public Health, Harvard University, USA
Dr Michael Suess
World Health Organization, Denmark
Professor James Woods Jr
Engineering Research Institute, Iowa State University, USA

2023510201

CONTENTS

	Page
RADON IN DWELLINGS: EXPOSURE AND RISK ANALYSIS	13
Nazaroff, W W Nero, A V	Transport of radon from soil into residences 15
Jonassen, N McLaughlin, J P	Airborne radon daughters, behavior and removal 21
Edling, C Wingren, G Axelson, O	Radon daughter exposure in dwellings and lung cancer 29
RADON: EXPOSURES AND RISKS	35
Swedjemark, G A Hjones, L	Exposure to the Swedish population to radon daughters 37
Fenyves, E J Kinslow, R H	Indoor radon concentrations in public buildings 45
Put, L W de Meijer, R J	Survey of radon concentrations in Dutch dwellings 49
Papastefanou, C Manolopoulou, M Savvides, El Charalambous, St	Exposure from radon and radon daughters in dwellings 55
Brown, L Green, B M R Miles, J C H Wrixon, A D	Radon exposure of the UK population 61
Burkart, W Wernli, C Brunner, H	Assessment of additional exposures and risks from airtightening of homes in an Alpine area with high radon emanation 67
Pershagen, G Damber, L Falk, R	Exposure to radon in dwellings and lung cancer: A pilot study 73
Bergman, H Edling, C Axelson, O	Indoor radon daughter concentrations and passive smoking 79
Wilson, C	Mapping the radon risk of our environment 85
Radford, E P St Clair Renard, K G	Application of studies of miners to radon problem in homes 93

2023510202

		8
RADON: SOURCES AND MEASUREMENT		97
Downard, T R Geiger, E L Millard, J B	Field evaluation of Eberline's radon daughter working level monitor	99
Oswald, R A Alter, H W	Localization of indoor radon sources using integrating track etch detectors	105
Paripas, B Takacs, S Somogyi, Gy Nikl, I	Integral alpha and gamma radiation mea- surements in dwelling houses	113
Schmied, H	The sensitivity to humidity of radon moni- toring instruments	119
Gustafsson, J Nilsson, I	Tracing of radon leakages	125
Hawthorne, A R Gammage, R B Dudney, C S	Effect of local geology in indoor radon levels: A case study	137
Kochari, B K	Contribution of soil gas, potable water, and building material to radon in US homes	143
Keller, G Folkerts, K H	A study on indoor radon	149
Jönsson, G	Radon measurements in Sweden. Some results	155
Martell, E A	Aerosol properties of indoor radon decay products	161
FIBRES AND PARTICULATES IN THE INDOOR ENVIRONMENT		167
van Houdt, J J Boisij, J S M	Mutagenic activity of indoor airborne particles compared to outdoors	169
Seifert, B Dreus, M Aurand, K	Indor heavy metal exposure of the popula- tion around a secondary lead smelter	177
Schneider, T	Man-made mineral fibers (MMF) and other fibers in the air and in settled dust	183
Sega, K Kalinic, M Sisovic, A	Indoor-outdoor relationships for respi- rable particles, total suspended particle matter and smoke concentrations in modern office buildings	189
McCarthy, S M Colome, S D Spengler, J D	Indoor and outdoor aerosols: A multi- variate approach to source identification	195

2023510203

		9
FIBRES AND PARTICULATES: CHARACTERIZATION AND RISKS		201
Weschler, C J Fong, K L	Characterization of organic species associated with indoor aerosol particles	203
Meckler, M	Analysis of low particulate size concentration levels in office environments	209
Janka, K Kuimala, V	Optical particle counter as a wide range, continuous monitor for particle concentrations	215
Rindal, A	Man-made-mineral fibres (MMMF) in indoor climate	221
Gunnarsson, M Bergström, B	Are man-made mineral fibres responsible for the development of bronchitis and atelectasis of the lung?	225
Tockman, M S Wheeler, P Frost, J K Bell Jr, W Levin, M Green, K	Pleural changes consistent with asbestos exposure found on screening radiographs are not predictive of lung cancer	229
EPIDEMIOLOGICAL STUDIES OF HEALTH DISORDERS RELATED TO HOUSING		235
Iversen, M Bach, E Lundqvist, G R	A prospective study of the health and comfort changes among tenants after retrofitting of their flats	237
Matsuki, H Yanagisawa, Y Osaka, F Kasuga, M Nishimura, R	Personal exposure to NO ₂ and its health effect with urinary hydroxyproline to creatinine ratio as biochemical indicator	243
Valbjörn, O Kousgård, M	Headache and mucus membrane irritation. An epidemiological study	249
Berwick, M Zagraniski, R T Leaderer, B P Stolwijk, J A J	Respiratory illness in children exposed to unvented combustion sources	255
Lutz, R Quackenbush, J J Spengler, J D	Effects of choice of exposure index in NO ₂ epidemiological studies	261

2023510204

		10
HOUSING EPIDEMIOLOGY		267
Goldstein, I Hartel, D Andrews, L	Indoor exposure of asthmatics to nitrogen dioxide	269
Loewenstein, J C Bourdel, M C Maffiolo, G Krainik, F Wolmark, Y	Relation of environmental conditions to the health of the elderly in a long term care hospital: A longitudinal survey	275
Mage, D T	A possible relationship of sudden infant death syndrome to indoor air quality	281
Speizer, F E Ware, J Dockery, D Ferris Jr, B G	Lack of effect of gas stoves on longitudinal change in lung function in children ages 6-11 years	287
PASSIVE SMOKING AND HEALTH EFFECTS		295
Weber, A	Environmental tobacco smoke exposure: acute effects - acceptance levels - protective measures	297
Schmidt, F	Passive smoking as a real risk to health	303
Ferris Jr, B G Dockery, D W Ware, J H Berkey, C S Speizer, F E	Effects of passive smoking on children in the six-cities study	309
Hoffmann, D Brunnemann, K D Adams, J D Haley, N J	Indoor air pollution by tobacco smoke: Model studies on the uptake by nonsmokers	313
Hugod, C	Passive smoking - a source of indoor air pollution	319
PASSIVE SMOKING: CHARACTERIZATION AND COUNTERMEASURES		327
Sterling, T D	Effects of restricting and prohibiting smoking in office environments on reactions of office personnel to environmental health and stress factors	329
Matsushita, H Mori, T	Nitrogen dioxide and nitrosamine levels in indoor air and side-stream smoke of cigarette	335

2023510205

		11
Lehti, H	Ashtray	341
Vertio, H		
Ramstedt, L M	Smokers' and non-smokers' perception of passive smoking and certain control measures	345
Winnke, G	Patterns and determinants of reaction to tobacco smoke in an experimental exposure setting	351
Plischke, K		
Roscovanu, A		
Schlipkoeter, H W		

2023510206